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MEMORANDUM

TO:	Michael Berkhoff, USEPA	REF. NO.:	056393-07
FROM:	Jodie Dembowske/Doug Gatrell/28	DATE:	January 22, 2014
CC:	Richard Gay, Weyerhaeuser, NR Company Kristi Zakrzewski, MDEQ Greg Carli, CRA		
RE:	12th Street Landfill - Landfill Gas Update Otsego Township, Michigan		

This memorandum has been prepared by Conestoga Rovers & Associates, Inc. (CRA) to summarize the results of the indoor air monitoring completed adjacent to the 12th Street Landfill (Site), Operable Unit No. 4 – Allied Paper/Portage Creek/Kalamazoo River Superfund Site, located in Otsego Township, Michigan on December 13, 2013. Also included in the Memorandum is an updated table of landfill gas readings collected from the on-site landfill gas probes.

The purpose of the indoor air monitoring was to further document the conditions relative to methane (CH_4), carbon dioxide (CO_2) and oxygen (O_2) inside of the Aggregate Industries Inc. geotechnical building per the Memorandum submitted by CRA to the United States Environmental Protection Agency (USEPA) Region 5 on August 26, 2013.

1.0 INTRODUCTION/BACKGROUND

CRA, on behalf of the Weyerhaeuser NR Company (Weyerhaeuser), has been conducting operation, maintenance, and monitoring activities at the 12th Street Landfill in accordance with the Operation, Maintenance, and Monitoring Plan (OM&M Plan) for the Site, which was approved by the USEPA on May 23, 2013. As part of the monitoring activities for the Site, CRA has obtained landfill gas readings from the three landfill gas probes installed along the southern and western perimeter of the Site on a quarterly basis from October 2011 through October 2013. In July 2013, two new gas probes were installed. GP-3A was installed adjacent to GP-3 at a shallower screened interval, in an attempt to avoid groundwater infiltration into the gas probe screen. GP-4 was installed near GP-2, south of the landfill and north of the Aggregate Industries Inc. buildings. Figure 1 shows the location of the gas probes and features adjacent to the landfill.

The gas probes have been monitored for percent CH_4, percent CO_2, percent O_2, and pressure on a quarterly basis since October 2011, an additional reading was collected on December 13, 2013 as part of the indoor air monitoring event. The results of the landfill gas probe monitoring are presented in Table 1. As shown in Table 1, levels of CH_4 have been observed in gas probes GP-1, GP-2 and GP-4 during the monitoring activities. There are no local receptors in the vicinity of GP-1; however, there is a possible receptor to the south southwest of GP-2 and GP-4 (approximately 100 feet).

The extent of the landfill gas present along the southern boundary of the Site was documented in the Memorandum – *Soil Gas and Landfill Gas Investigation – July 2013* submitted to the USEPA on August 26, 2013.

2.0 SCOPE OF WORK

Gas Probe Monitoring
Landfill gas readings (pressure, CH_4, CO_2, O_2) from GP-1, GP-2, GP-3A and GP-4 were collected. Readings were not able to be collected from GP-3 due to water within the probe.

Indoor Air Monitoring – Adjacent Potential Receptor
Indoor air monitoring was conducted from the interior of the occupied Aggregate Industries, Inc. geotechnical building located south of the landfill at 475 12th Street, Plainwell, Michigan. The two unoccupied Aggregate Industries storage buildings north of the geotechnical building were not included in the indoor air monitoring conducted in December.

The geotechnical laboratory (i.e., the southern 1,008 square foot building) was constructed on a concrete slab in 1984 and is occupied Monday through Friday by one individual approximately 4-5 hours per day. The western two-thirds of the building are used as the geotechnical laboratory. Large (closet sized) shaker units and a natural gas fired stove are present in this portion of the building. The natural gas stove is in a well-ventilated open space of the building as illustrated on Figure 1. Typical operations include the operation of the natural gas stove to dry soil/aggregate samples. The stoves were not in use for 6 days before the monitoring event. Additional space within the building includes an office at the southeast corner, a restroom with a sink and shower near the center of the building and the mechanical room, with the natural gas furnace, located in the north central portion of the building. The floor is bare concrete except for the bathroom and the back storage room which had linoleum covering the concrete floor. Cracks or holes were not observed in the concrete floor and the linoleum was in good overall condition. Floor drains were present in the restroom shower and the mechanical room.

Indoor air monitoring was conducted at the concrete slab in 13 locations, including the two floor drains, within the geotechnical laboratory as shown on Figure 2. Monitoring was targeted at cracks, concrete seams and drains within the building and was consistent with the locations selected in July 2013. Readings for percent CH4, percent CO2, and percent O2, were collected using a Landtec GEM 500. The results of the geotechnical laboratory building monitoring are presented in Table 2.

3.0 LANDFILL GAS RESULTS & DISCUSSION

GP-1
Landfill gas readings collected between October 2011 and December 2013 are shown graphically on Figure 3. The graph shows the readings of CH_4, CO_2 and O_2 are generally consistent throughout the monitoring period. As stated previously, local receptors are not present in the area of GP-1. Figure 3 provides a graphical representation of the landfill gas data collected to date from GP-1.

GP-2
Figure 4 presents the data collected for GP-2 between October 2011 and December 2013. The data is consistent with the exception of the July 2012 event, which appears to be abnormally low for CH_4 and is likely an outlier in the data set. As noted above GP-4 was installed adjacent to GP-2, with a targeted screened interval of 15 to 20 feet below grade level. GP-2 is screened between 5 and 30 feet below grade. Landfill gas data collected from GP-2 is shown on Figure 4.

GP-3 and GP-3A
GP-3A was installed in July 2013 as part of the Soil Gas Investigation activities and thus only two monitoring events (October 2013 and December 2013) have been completed with GP-3A. GP-3A has not been reported with detectable

levels of CH_4. GP-3A is intended to supplement readings at GP-3 during times of high groundwater levels, and be used in conjunction with readings from GP-3 when that probe's screened interval is above groundwater levels. Landfill gas readings from GP-3 and GP-3A are presented as a graph on Figure 5.

GP-4
GP-4 was recently installed as part of the July 2013 Soil Gas Investigation and therefore only two monitoring events (October 2013 and December 2013) have been completed with this gas probe. CH_4 readings obtained from GP-4 are slightly lower than those at GP-2. Figure 6 provides a graphical representation of the landfill gas data collected to date from GP-4.

Aggregate Industries - Geotechnical Laboratory
CH_4 was detected at 0.1 percent by volume at 5 (D, G, H, I, and K) of the 13 monitoring locations within the geotechnical laboratory. Monitoring locations throughout the building are shown on Figure 2 and are consistent with those selected during the July 2013 initial monitoring event. The results of the monitoring event are included in Table 2.

4.0 CONCLUSIONS AND RECOMMENDATIONS

GP-1
GP-1 will continue to be monitored on a quarterly basis. There are no local receptors in this area; therefore, no further action is required in this portion of the Site.

GP-2
The July 2013 field investigation identified at this location a distribution of methane that dissipated to non-detect levels at depth towards the southern direction. Therefore, as a precautionary measure, GP-2 will continue to be monitored on a quarterly basis.

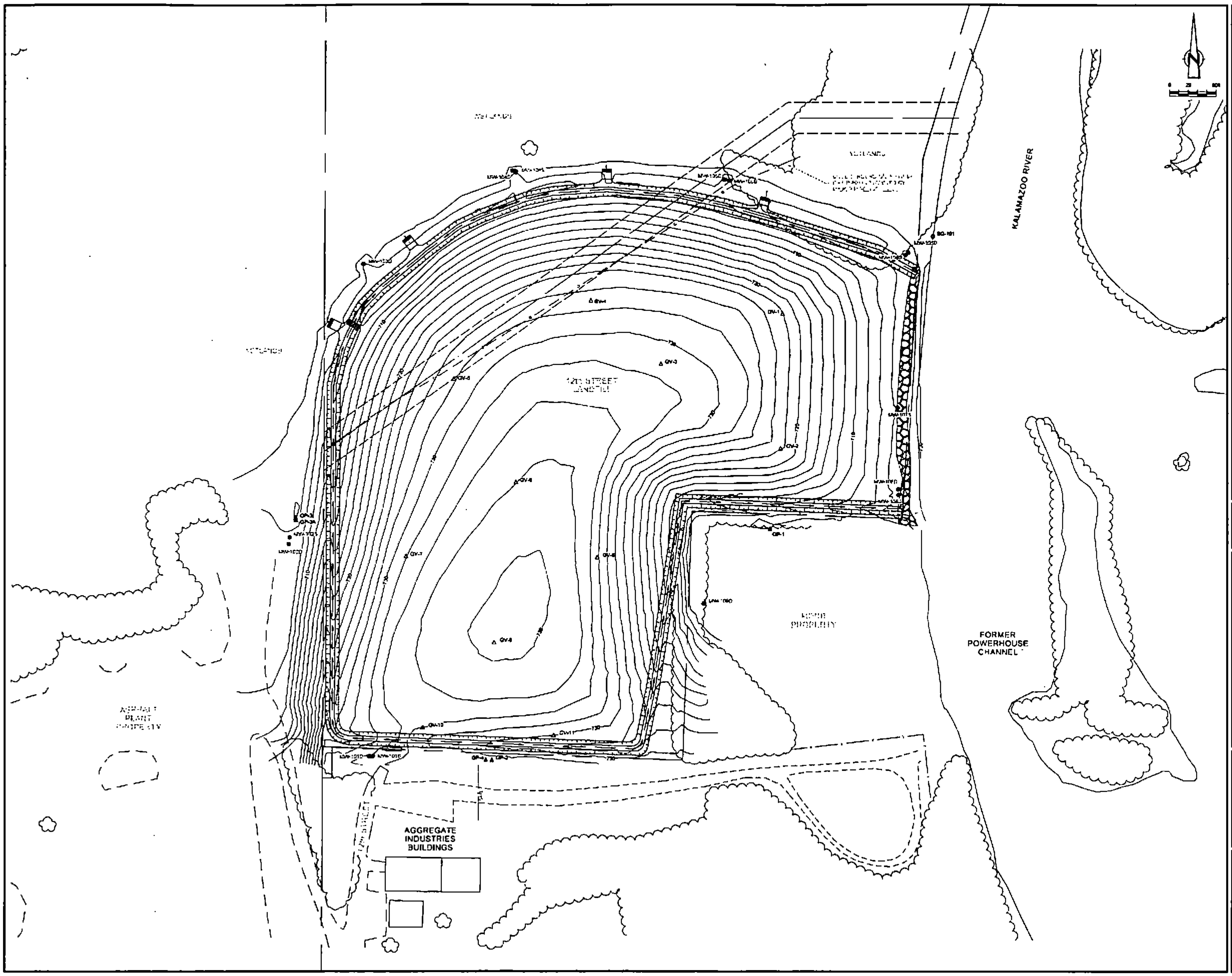
GP-3 and GP-3A
GP-3 and GP-3A will continue to be monitored on a quarterly basis as groundwater levels allow.

GP-4
GP-4 will continue to be monitored on a quarterly basis.

Aggregate Industries Geotechnical Building
Detections of CH_4 below the Occupational Safety and Health Administration screening level for ambient air of 0.5 percent were recorded within the geotechnical building during both the July and December 2013 monitoring events. CH_4 levels recorded do not represent an immediate health impact.

Weyerhaeuser is proposing two additional indoor air monitoring events (June and December 2014) to verify consistency of the air quality within the Aggregate Industries geotechnical building.

FIGURES



LEGEND

- APPROXIMATE PROPERTY BOUNDARY
- EXISTING PAVED ROAD
- EXISTING UNPAVED ROAD
- EXISTING EDGE OF WATER
- EXISTING TREES AND/OR BRUSH
- 718 FINAL ELEVATION CONTOURS
- ROAD/DRAINAGE SWALE
- GV-1 GAS VENT LOCATION
- MW-114D MONITORING WELL LOCATION
- GP-1 GAS PROBE LOCATION
- SG-101 STAFF GAUGE LOCATION

SCALE VERIFICATION

THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

Approved

DRAWING STATUS

Status	Date	Initial

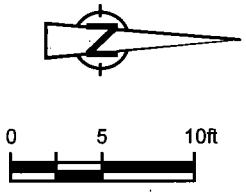
12th STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN

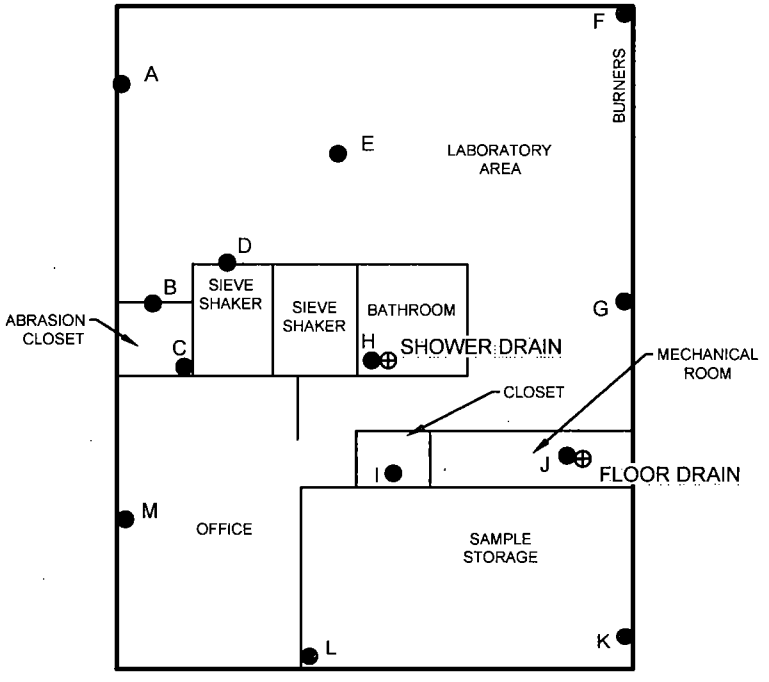
SITE FEATURES

CONESTOGA-ROVERS & ASSOCIATES

Source Reference: BASE ADAPTED FROM PREVIOUS RMT DESIGN

Project Manager	Reviewed By	Date	
J. DEMBOWSKE	G. CARLI	JULY 2013	
Scale	**Project No**	**Report No**	**Drawing No**
AS SHOWN	056393-07	MEMO028	figure 1





LEGEND

L MONITORING LOCATION

figure 2

INDOOR AIR MONITORING LOCATIONS
AGGREGATE INDUSTRIES - GEOTECHNICAL LABORATORY
12TH STREET LANDFILL
Otsego Township, Michigan

056393-07(MEMO028)GN-SC002 JAN 6/2014

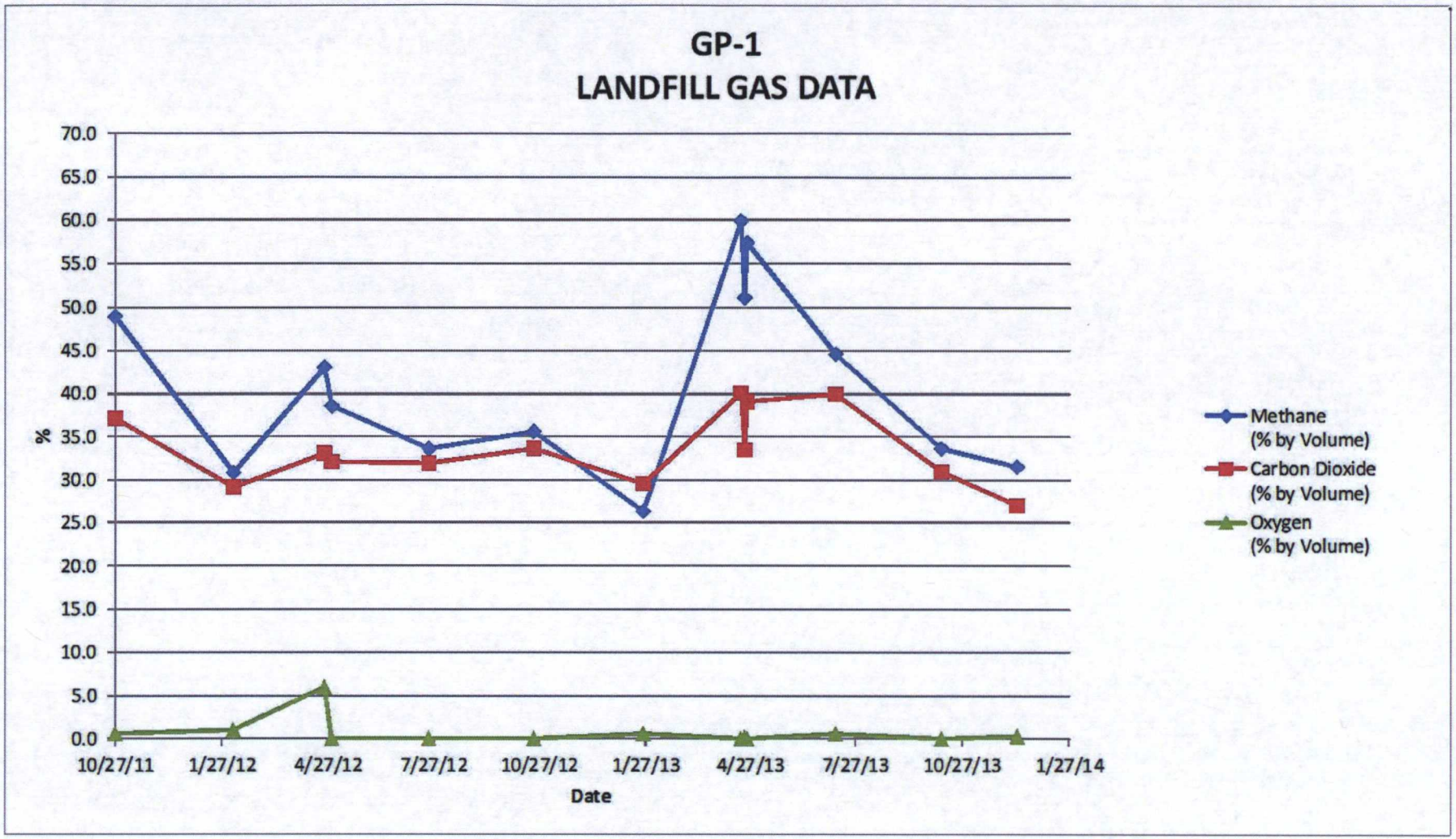


figure 3

GP-1
GAS PROBE DATA
12TH STREET LANDFILL
Otsego Township, Michigan

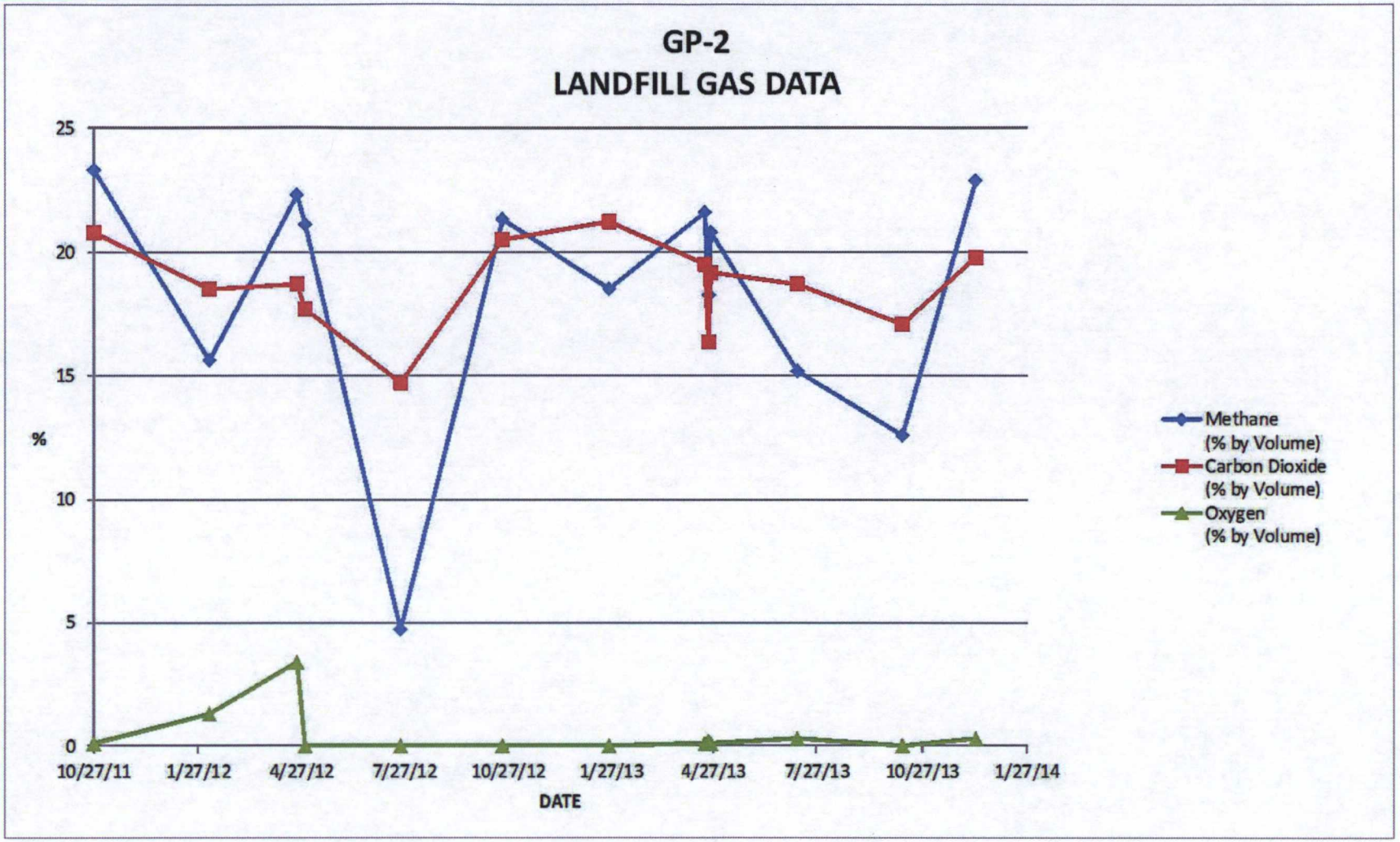


figure 4

GP-2
GAS PROBE DATA
12TH STREET LANDFILL
Otsego Township, Michigan

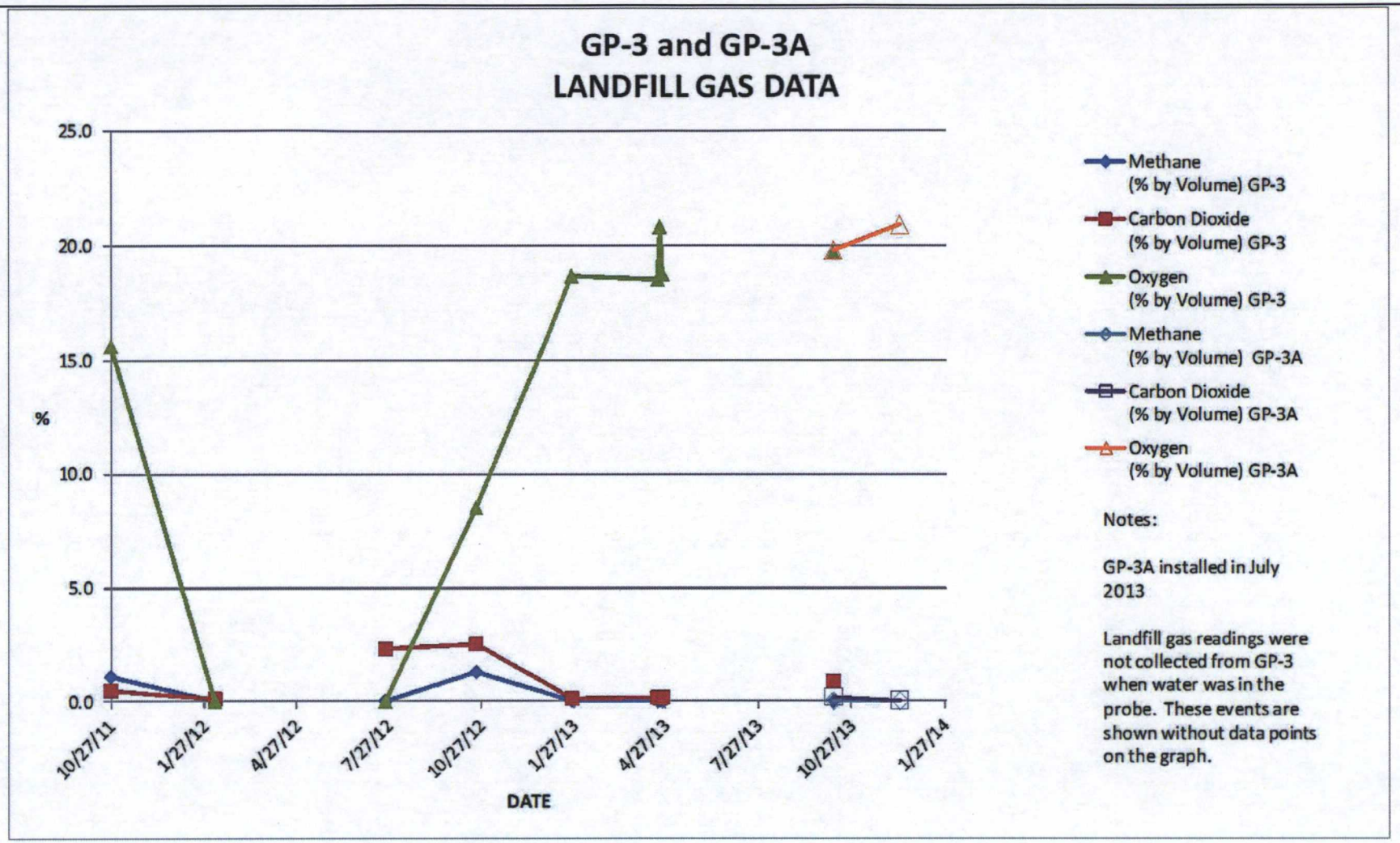


figure 5

GP-3
GAS PROBE DATA
12TH STREET LANDFILL
Otsego Township, Michigan

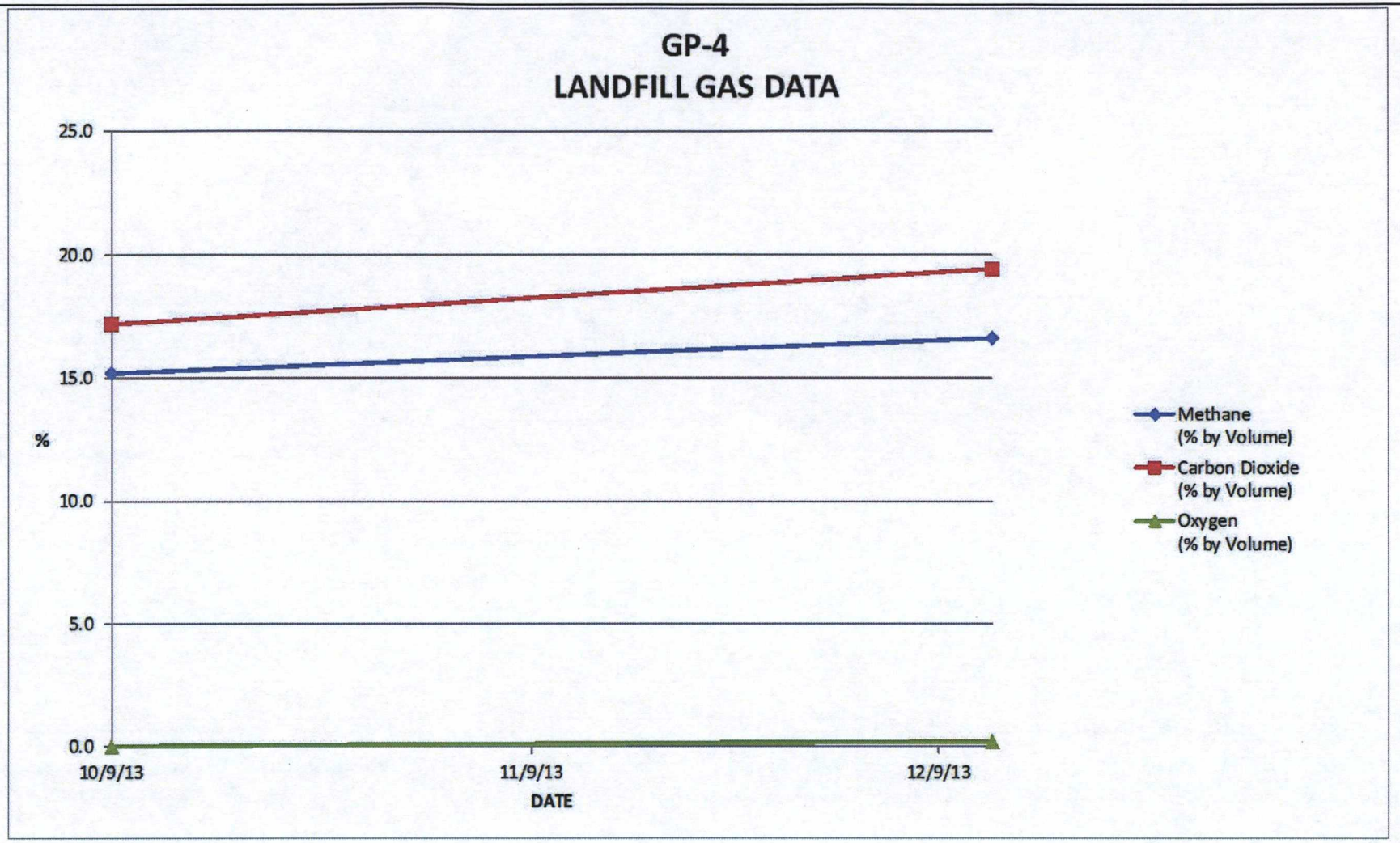


figure 6

GP-4
GAS PROBE DATA
12TH STREET LANDFILL
Otsego Township, Michigan

TABLES

TABLE 1

LANDFILL GAS QUALITY MONITORING
GAS PROBES OCTOBER 2011 - DECEMBER 2013
SOIL GAS AND LANDFILL GAS INVESTIGATION
12th STREET LANDFILL SITE
OTSEGO TOWNSHIP, MICHIGAN

Location	Ground Surface Elevation	Probe Depth (Feet)	Screen Length (Feet)	Top of Screen Elevation (Feet AMSL)	Seconds Purged	Date	Pressure (Inches of W/C)	Methane (% by Volume)	Carbon Dioxide (% by Volume)	Oxygen (% by Volume)
GP-1	707.35	4	2	705.35	300	10/27/11	0.00	49.0	37.1	0.6
					300	2/6/12	0.01	30.9	29.2	1.0
					300	4/23/12	-0.01	43	33.1	6.0
					300	4/30/12	0.00	38.5	32.1	0.0
					300	7/23/12	0.01	33.7	32.0	0.0
					300	10/22/12	0.00	35.6	33.7	0.0
					300	1/25/13	0.00	26.4	29.5	0.6
					300	4/19/13	0.03	59.9	40.1	0.0
					300	4/22/13	0.01	51.1	33.5	0.2
					300	4/24/13	0.01	57.4	39.1	0.0
					300	7/10/13	0.00	44.6	40.0	0.6
					300	10/9/13	0.00	33.6	31.0	0.0
					300	12/13/13	0.00	31.6	27.0	0.3
GP-2	732.88	35	25	727.88	300	10/27/11	-0.10	23.3	20.8	0.1
					300	2/6/12	0.00	15.6	18.5	1.3
					300	4/23/12	0.00	22.3	18.7	3.4
					300	4/30/12	0.00	21.1	17.7	0.0
					300	7/23/12	0.00	4.7	14.7	0.0
					300	10/22/12	-0.01	21.3	20.5	0.0
					300	1/25/13	0.04	18.5	21.2	0.0
					300	4/19/13	0.09	21.6	19.5	0.1
					300	4/22/13	0.03	18.3	16.4	0.2
					300	4/24/13	0.03	20.8	19.2	0.1
					300	7/10/13	0.03	15.2	18.7	0.3
					300	10/9/13	0.00	12.6	17.1	0.0
					300	12/13/13	0.00	22.9	19.8	0.3
GP-3	703.51	5	2	700.51	300	10/27/11	-0.00	1.1	0.5	15.6
					300	2/6/12	0.00	0.0	0.1	21.6[1]
					<300	4/23/12	0.00	NC[2]	NC[2]	NC[2]
					<300	4/30/12	0.00	NC[2]	NC[2]	NC[2]
					300	7/23/12	0.04	0.0	2.3	07.4
					300	10/22/12	0.00	1.3	2.5	8.5
				Water in probe	<300	1/25/13	0.06	0.0	0.1	18.7
				Water in probe	68	4/19/13	0.04	0.0	0.2	18.5
				Water in probe	70	4/22/13	0.05	0.0	0.1	20.8
				Water in probe	65	4/24/13	0.05	0.0	0.2	18.8
				Water in probe	<300	7/11/13	NC[2]	NC[2]	NC[2]	NC[2]
					300	10/9/13	0.00	0.0	0.9	19.7
				Water in probe	NA	12/13/13	NC[2]	NC[2]	NC[2]	NC[2]

LANDFILL GAS QUALITY MONITORING
GAS PROBES OCTOBER 2011 - DECEMBER 2013
SOIL GAS AND LANDFILL GAS INVESTIGATION
12th STREET LANDFILL SITE
OTSEGO TOWNSHIP, MICHIGAN

Location	Ground Surface Elevation	Probe Depth (Feet)	Screen Length (Feet)	Top of Screen Elevation (Feet AMSL)	Seconds Purged	Date	Pressure (inches of W/C)	Methane (% by Volume)	Carbon Dioxide (% by Volume)	Oxygen (% by Volume)
GP-3A	703.81	2	0.8	702.61	300	10/09/13	0.01	0.0	0.2	19.8
					300	12/13/13	0.00	0.0	0.0	20.9
GP-4	732.95	20	5	717.95	300	10/09/13	0.00	15.2	17.2	0.0
					300	12/13/13	0.00	16.6	19.4	0.2

Notes:
GP-3A was installed July 11, 2013
GP-4 was installed July 11, 2013
W/C = Water Column
NC = Not Collected
NA= Not Applicable
(1) = High oxygen and low carbon dioxide indicates potential short circuiting in probe.
(2) = Water in bottom of probe.

TABLE 2

INDOOR AIR MONITORING GEOTECHNICAL LABORATORY
SOIL GAS AND LANDFILL GAS INVESTIGATION
12th STREET LANDFILL
OTSEGO TOWNSHIP, MICHIGAN

Location	Date	Methane* (% by Volume)	Carbon Dioxide * (% by Volume)	Oxygen* (% by Volume)
A	7/11/2013	0.0	0.0	20.8
	12/13/2013	0.0	0.0	21.0
B	7/11/2013	0.0	0.0	20.8
	12/13/2013	0.0	0.0	21.1
C	7/11/2013	0.0	0.0	21.0
	12/13/2013	0.0	0.0	21.0
D	7/11/2013	0.1	0.0	21.0
	12/13/2013	0.1	0.0	21.0
E	7/11/2013	0.1	0.0	21.3
	12/13/2013	0.0	0.0	21.0
F	7/11/2013	0.1	0.0	21.3
	12/13/2013	0.0	0.0	21.1
G	7/11/2013	0.1	0.0	21.3
	12/13/2013	0.1	0.0	21.1
H	7/11/2013	0.1	0.0	21.3
	12/13/2013	0.1	0.0	21.0
I	7/11/2013	0.1	0.0	21.2
	12/13/2013	0.1	0.0	21.0
J	7/11/2013	0.1	0.0	21.1
	12/13/2013	0.0	0.0	20.1
K	7/11/2013	0.1	0.0	21.2
	12/13/2013	0.1	0.0	20.3
L	7/11/2013	0.1	0.0	21.2
	12/13/2013	0.0	0.0	21.1
M	7/11/2013	0.1	0.0	21.2
	12/13/2013	0.0	0.0	21.1